Immobilization of recombinant *Escherichia coli* on multi-walled carbon nanotubes for xylitol production

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ABSTRACT

E. coli has been engineered to produce xylitol, but the production faces bottlenecks in terms of production yield and cell viability. In this study, recombinant *E. coli* (rE*. coli*) was immobilized on untreated and treated multiwalled carbon nanotubes (MWCNTs) for xylitol production. The immobilized r*E. coli* on untreated MWCNTs gave the highest xylitol production (5.47 g L^{-1}) and a productivity of 0.22 g L^{-1} h^{-1}. The doubling time for the immobilized cells increased up to 20.40 h and was higher than that of free cells (3.67 h). Cell lysis of the immobilized cells was reduced by up to 73 %, and plasmid stability improved by up to 17 % compared to those of free cells. Xylitol production using the optimum parameters (pH 7.4, 0.005 mM and 29 °C) achieved a xylitol production and productivity of 6.33 g L^{-1} and 0.26 g L^{-1} h^{-1}, respectively. A seven-cycle repeated batch fermentation was carried out for up to 168 h, which showed maximum xylitol production of 7.36 g L^{-1} during the third cycle. Hence, this new adsorption immobilization system using MWCNTs is an alternative to improve the production of xylitol.

KEYWORDS

Xylitol; Cell immobilization; *Escherichia coli*multi-walled carbon nanotubes; Shake flask fermentation

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